

LISTING OF CLAIMS

The following listing of the claims replaces and supersedes all earlier versions. Please amend the claims to read as follows:

Claim 1 (original). A method for manufacturing methanol and acetic acid, characterized by the integrated steps of:

separating a hydrocarbon source into first and second hydrocarbon streams;

steam reforming the first hydrocarbon stream with steam to produce a reformed stream;

autothermal reforming of a mixture of the reformed stream and the second hydrocarbon stream with oxygen and carbon dioxide to produce a syngas stream;

separating a minor portion of the syngas stream into a carbon dioxide-rich stream, a hydrogen-rich stream, and a carbon monoxide-rich stream;

recycling the carbon dioxide-rich stream to the autothermal reforming; compressing a remaining portion of the syngas stream, at least a portion of

the hydrogen-rich stream to supply a makeup stream to a methanol synthesis loop to obtain a methanol product; and

synthesizing acetic acid from at least a portion of the methanol product and the carbon monoxide-rich stream.

Claim 2 (currently amended). The method of claim 1, wherein the makeup stream has a[[n]] stoichiometric number (SN) between 2.0 and 2.1, wherein the SN is calculated from component concentrations as $[(H_2-CO_2)/(CO+CO_2)]$.

Claim 3 (currently amended). The method of any one of the preceding preceding claims, further comprising supplying a purge gas stream from the methanol synthesis loop to the separation step of separating the minor portion of the syngas stream into a carbon dioxide-rich stream, a hydrogen-rich stream, and a carbon monoxide-rich stream.

Claim 4 (currently amended). The method of any one of the preceding claims 1, wherein the autothermal reformer is a single train autothermal reformer.

Claim 5 (currently amended). The method of any one of the preceding claims 1, wherein the separation step of separating the minor portion of the syngas stream into a carbon dioxide-rich stream, a hydrogen-rich stream, and a carbon monoxide-rich stream, includes supplying the minor portion of the syngas to a methane wash cold box unit.

Claim 6 (currently amended). The method of claim 5, wherein a flash gas from the separation step of separating the minor portion of the syngas stream into a carbon dioxide-rich stream, a hydrogen-rich stream, and a carbon monoxide-rich stream, is recycled to the methanol synthesis loop.

Claim 7 (original). The method of any one of claims 5 or 6, wherein a tail gas stream from the cold box is recycled as feed gas.

Claim 8 (currently amended). The method of any one of the preceding claims 1, wherein carbon dioxide emissions are less than 10% of the total carbon input.

Claim 9 (currently amended). The method of any one of claims 1([-7]), wherein carbon dioxide emissions are less than 5 percent of the total carbon input.

Claim 10 (currently amended). The method of any one of the preceding claims 1, wherein a first portion of the hydrogen-rich stream from the separation step is recycled to the methanol synthesis loop and a second portion is sent as feed to an associated process.

Claim 11 (currently amended). The method of any one of the preceding claims 1, further comprising supplying a carbon dioxide stream from an associated process to supply the makeup stream.

Claim 12 (original). The method of any one of claims 10 or 11, wherein the associated process uses the acetic acid as a reactant, uses the methanol product as a reactant, shares oxygen from a common air separation unit, shares common utilities, or a combination thereof.

Claim 13 (currently amended). The method of ~~any one of~~ claims [[10-]]12, further comprising:

providing at least a portion of the acetic acid produced to a vinyl acetate monomer synthesis loop in the associated process;
combining the portion of the acetic acid with an ethylene source and oxygen to produce vinyl acetate monomer.

Claim 14 (original). The method of claim 13, wherein a single air separation unit supplies oxygen to the associated process and the autothermal reformer.

Claim 15 (currently amended). The method of ~~any one of the preceding~~ claims 1, wherein at least 10% of the syngas stream is directed to the separation step of separating the minor portion of the syngas stream into a carbon dioxide-rich stream, a hydrogen-rich stream, and a carbon monoxide-rich stream.

Claim 16 (currently amended). The method of ~~any one of the preceding~~ claims 1, wherein the methanol produced is between 1,000 and 30,000 tons/day.

Claim 17 (currently amended). The method of ~~any one of the preceding~~ claims 1, wherein the acetic acid produced is between 500 and 6,000 metric tons/day.

Claim 18 (currently amended). The method of ~~any preceding~~ claim 1, further comprising importing a CO2-rich stream to the methanol synthesis loop.

Claim 19 (original). The method of claim 13, further comprising importing a CO2-rich stream from the vinyl acetate monomer synthesis loop to the methanol synthesis loop.

Claim 20 (currently amended) The method of claim 18 ~~or 19~~, wherein the hydrocarbon source comprises natural gas and a ratio of the imported CO2 stream to the hydrocarbon source is at least 0.05 kg CO2 per Nm3 natural gas.

Claim 21 (original). The method of claim 20, wherein the ratio of the imported CO2 stream to the natural gas is at least 0.2 kg CO2 per Nm3 natural gas.

Claim 22 (original). The method of claim 19, wherein the ratio of the imported CO2 to the natural gas is at least 0.23 kg CO2 per Nm3 natural gas.

Claim 23 (currently amended). The method of ~~any one of the preceding~~ claims 1, comprising:

diverting between 35 and 65% of the feed gas stream to the first stream; and
diverting between 35 and 65% of the feed gas stream to the second stream.

Claim 24 (currently amended). The method of ~~any one of the preceding~~ claims 1, comprising:

diverting 45 to 55% of the feed gas stream to the first stream; and
diverting 45 to 55% of the feed gas stream to the second stream.

Claim 25 (currently amended). The method of any preceding claim 1 wherein the separation step of separating the minor portion of the syngas stream into a carbon dioxide-rich stream, a hydrogen-rich stream, and a carbon monoxide-rich stream, produces a tail gas stream enriched in inert.